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PanOptix™: Demonstrating the Evidence

An update on clinical evidence for the PanOptix™ trifocal IOL

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PanOptix™: Demonstrating the Evidence

September 2015 marked the European launch of the AcrySof® IQ PanOptix™ IOL – Alcon's latest multifocal IOL – which features innovative ENLIGHTEN™ optical technology. The innovative lens design in this presbyopia-correcting IOL allows optimized light utilization and provides patients with a more comfortable range of near to intermediate vision with less dependence on pupil size than other bifocal designs (1). But in the years since its launch, how has this multifocal IOL performed in the clinic? And how do visual outcomes compare with other currently available multifocal IOLs?

"The clinical evidence base for PanOptix™ has grown considerably and proved the predictions at launch to be true."

With several prospective clinical studies now complete, and the number of surgeons with experience of the platform increasing, the evidence base for PanOptix™ has grown considerably. In this clinical update, recently published and presented PanOptix™ clinical data from experienced surgeons are overviewed.

Table 1. Visual outcomes with PanOptix™ one month postoperatively (2)

Outcome	*Result*
Mean UDVA, LogMAR (SD)	0.03 (0.046)
Patients achieving UDVA 0.1 LogMAR (20/25) or better	96.6%
Mean UIVA, LogMAR (SD)	0.12 (0.143)
Patients achieving UIVA 0.1 LogMAR or better	56.9%
Mean UNVA, LogMAR (SD)	0.02 (0.099)
Patients achieving UNVA 0.1 LogMAR or better	86.2%

UDVA, uncorrected distance visual acuity; UIVA, uncorrected intermediate visual acuity (60 cm); UNVA, uncorrected near visual acuity (33 cm); SD, standard deviation. Results under photopic conditions (85 cd/m^2)

Table 2. Visual outcomes with PanOptix™ up to two months postoperatively (3)

Outcome	*Result*
Mean UDVA, LogMAR (SD)	0.01 (0.10)
Patients achieving UDVA 0.1 LogMAR (20/25) or better	93.9%
Mean UIVA, LogMAR (SD))	0.30 (0.14)
Patients achieving UIVA 0.1 LogMAR (20/25) or better	7.4%
Patients achieving UIVA 0.2 LogMAR (20/32) or better	88.9%
Mean UNVA, LogMAR (SD)	0.18 (0.10)
Patients achieving UNVA 0.1 LogMAR or better	85.2%

UDVA, uncorrected distance visual acuity; UIVA, uncorrected intermediate visual acuity (60 cm); UNVA, uncorrected near visual acuity (40 cm); SD, standard deviation.

PanOptix™ clinical outcomes

Two recent publications have reported on short-term visual outcomes with PanOptix™: Garcia-Perez et al. (2; 2017) reported visual outcomes one month after surgery in 58 patients (116 eyes) who underwent bilateral implantation at the Clínica Rementería Madrid, Spain (2); and Lawless et al. (3; 2017) reported on a retrospective case series that assessed outcomes up to two months postoperatively in 33 patients (66 eyes) who received bilateral implantation at the Vision Eye Institute, Sydney and Melbourne, Australia. Visual outcomes are shown in Table 1 (2) and Table 2 (3).

The monocular defocus curves reported by Garcia-Perez et al. showed a LogMAR acuity ≤0.1 between +0.50 and -2.00 D (Figure 1). Mean post-operative spherical equivalent (SE) was found to be -0.10 ± 0.26

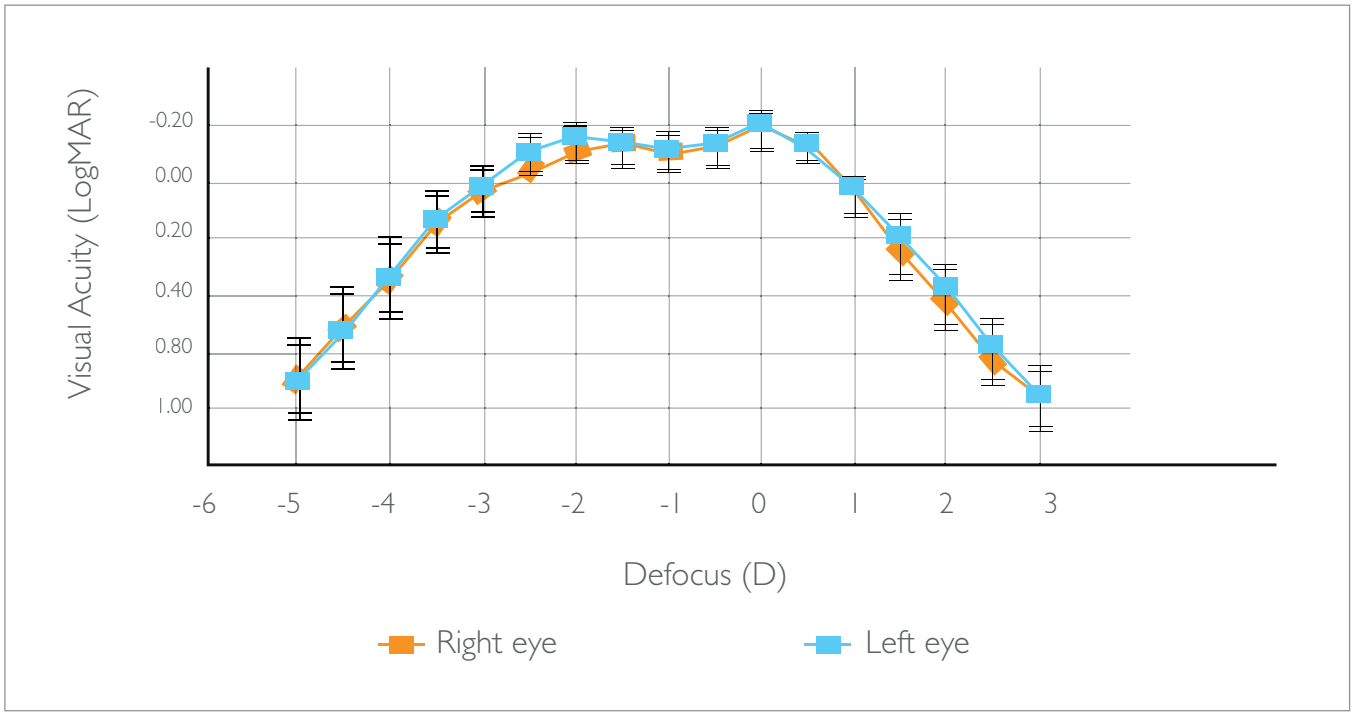


Figure 1. Monocular distance-corrected defocus curve given in LogMAR 1 month after surgery (2).

at one month postoperatively (2) and 0.08 ± 0.25 D up to two months follow-up (3). Spectacle independence at all distances was reported by over 94.8 percent of patients one month after implantation (2).

PanOptix™: clinical experiences at six months postoperatively

Prof. Thomas Kohnen of Goethe University, Frankfurt, Germany, presented a prospective, single-arm, non-randomized multicenter clinical study sponsored by Alcon (4) at the XXXV Congress of the European Society of Cataract and Refractive Surgeons (ESCRS), where the binocular defocus curve of PanOptix™ at 6 months post-implantation was determined. A total of 143 patients who had received bilateral implantation of PanOptix™ were followed up for 6 months. The binocular defocus curve for PanOptix™ demonstrated an approximate VA of 20/25 or better from near (40 cm) through intermediate (60 cm) to distance (Figure 2).

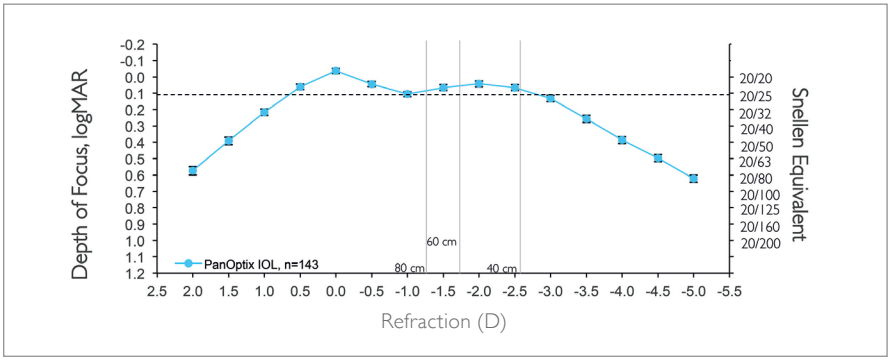


Figure 2. Binocular defocus curve for PanOptix™ at 6 months (4). Binocular defocus testing was performed under photopic conditions (~85 cd/m²) using a 100% ETDRS chart at 4 m. Subjects were defocused from manifest refraction using a -5.00 D and +2.00 D spherical correction in 0.5 D increments increments. Data reflect mean and 90% confidence intervals.

Table 3. Postoperative outcomes with PanOptix™ at 6 months (5)

Parameter	*Postoperative outcome ± SD*
Spherical equivalent (D)	0.14 ± 0.35
Binocular UDVA (LogMAR)	0.1 ± 0.07
CDVA (LogMAR)	-0.10 ± 0.05
Binocular UIVA (LogMAR)	0.10 ± 0.15
Binocular UNVA (LogMAR)	0.20 ± 0.25

"The binocular defocus curve for PanOptix™ demonstrated an approximate VA of 20/25 or better from near (40 cm) through intermediate (60 cm) to distance."

Six-month results of PanOptix™ have also been reported by Prof. Johnny Moore of the Cathedral Eye Clinic, Belfast, Northern Ireland, UK (5). Visual outcome and subjective experiences were evaluated in 20 patients who received bilateral implantation of PanOptix™. He reported that patients had good uncorrected distance, intermediate and near VA (Table 3). Out of the 20 patients, 17 (85 percent) reported that they were completely independent of spectacles.

Quality of Vision (QoV) scores for night and day and Quality of Life (QoL) scores for distance, intermediate and near tasks improved at 6 months postoperatively. Glare and haloes visual symptoms were significantly decreased at 6 months postoperatively ($p<0.05$ for both). Moore concluded that, for a small percentage of patients, photic phenomena should be expected within 3 months, but this improves within 6 months (5).

Comparing outcomes

In the period since PanOptix™ was launched, several surgeons have directly studied how PanOptix™ performs in relation to other currently available multifocal lenses, such as the FineVision IOL (PhysIOL), the AT-LISA tri IOL (Zeiss) and the Symfony extended depth of focus (EDOF) IOL (Johnson & Johnson Vision). Features of different multifocal IOLs are presented in Box 1, and outcomes of these studies are overviewed below.

PanOptix™ compared with FineVision

Gundersen et al. (10; 2017) assessed and compared the quality of vision and clinical performance of PanOptix™ and FineVision 6 months to 2 years

Box 1. IOL Characteristics

AcrySof® IQ PanOptix™ trifocal multifocal IOL (Alcon) (6)

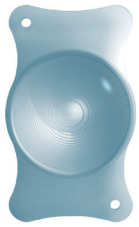
- Hydrophobic acrylate/methacrylate copolymer
- Optic 6.0 mm, overall diameter 13.0 mm
- Non-apodized new trifocal design
- Redirects light from the 3rd step height to distance
- Intermediate +2.17 D add
- Near +3.25 D add
- Spherical range: 6 to +34.0 D
- Light distribution less dependent on pupil size

FineVision MicroF trifocal multifocal IOL (PhysIOL) (7)

- Hydrophilic acrylate
- Optic 6.15 mm, overall diameter 10.75 mm
- Combination of 2 apodized diffractive profiles
- Intermediate +1.75 D add; near +3.5 D add
- Spherical range: +10.0 to +35.0 D
- Light distribution dependent on pupil size

AT-LISA tri 839MP trifocal multifocal IOL (Zeiss) (8)

- Hydrophilic acrylate with hydrophobic surface properties
- Optic 6.0 mm, overall diameter 11.00 mm
- Trifocal over 4.34 mm, bifocal from 4.34–6.0 mm
- Diffractive profile using "smooth steps"
- Intermediate +1.66 D add
- Near +3.33 D add
- Spherical range: 0.0 to +32.0 D
- Maximized pupil-independent design



TECNIS Symfony EDOF IOL (Johnson & Johnson Vision) (9)

- Hydrophobic acrylate
- Optic 6.0 mm, overall diameter 13.0 mm
- Posterior achromatic diffractive surface and echellette feature
- Intermediate +1.75 D add
- Spherical range: +5.0 to +34.0 D
- Pupil-independent

after bilateral implantation in an Alcon supported study. A total of 30 patients were recruited into each study group.

The best distance-corrected binocular defocus curves (Figure 3) showed differences at three vergences, with FineVision performing better at a vergence of -1.0 D ($p=0.02$) and PanOptix™ performing better at vergences of -1.5 D and -2.0 D ($p<0.01$ for both). For best distance-corrected and uncorrected binocular vision, PanOptix™ performed better at a distance of 60 cm ($p\leq0.01$ for both), a finding that Gundersen et al. noted: "may be important to users of tablets and other handheld devices" (10). Subjects in both groups had a preferred reading distance between 42 and 43 cm, with VA in PanOptix™ subjects at the preferred reading distance being slightly better than in FineVision subjects ($p=0.04$). Examinations of low contrast VA and quality of vision showed that there were no differences between PanOptix™ and FineVision IOLs.

At the XXXV Congress of the ESCRS, Dr. Pérez-Cambrodí and the Oftalmar Research Group presented their own experience in cataract surgery patients who had received PanOptix™ (19 eyes from 11 patients) or FineVision IOLs (31 eyes from 16 patients) (11). Patients were followed up at 3 months post-surgery. The authors found that PanOptix™ provides more predictable refractive results compared to FineVision with better visual acuity outcomes at distance and near positions. The defocus curves showed significantly better VA values for PanOptix™ at -2.50 ($p<0.001$) and -2.00 ($p=0.016$), and better outcomes for FineVision at -1.00 ($p=0.04$) and +1.00 ($p<0.001$). They concluded that both diffractive IOLs provided functional levels of VA for far, intermediate and near distances. PanOptix™ was noted to provide more predictable refractive results than FineVision, as well as a closer intermediate focus. Further studies also show differences between PanOptix™ and FineVision in contrast and postoperative disturbances (see Figure 7).

Figure 3. Best distance-corrected binocular defocus curve for PanOptix™ (PX) and FineVision (FV) (10). Vertical bars denote 0.95 confidence intervals. Order Detail ID: 70858765, Clinical Ophthalmology by Society for Clinical Ophthalmology (Great Britain) Reproduced with permission of Dove Medical Press Limited in the format Republish in brochure/promotional materials via Copyright Clearance Center.

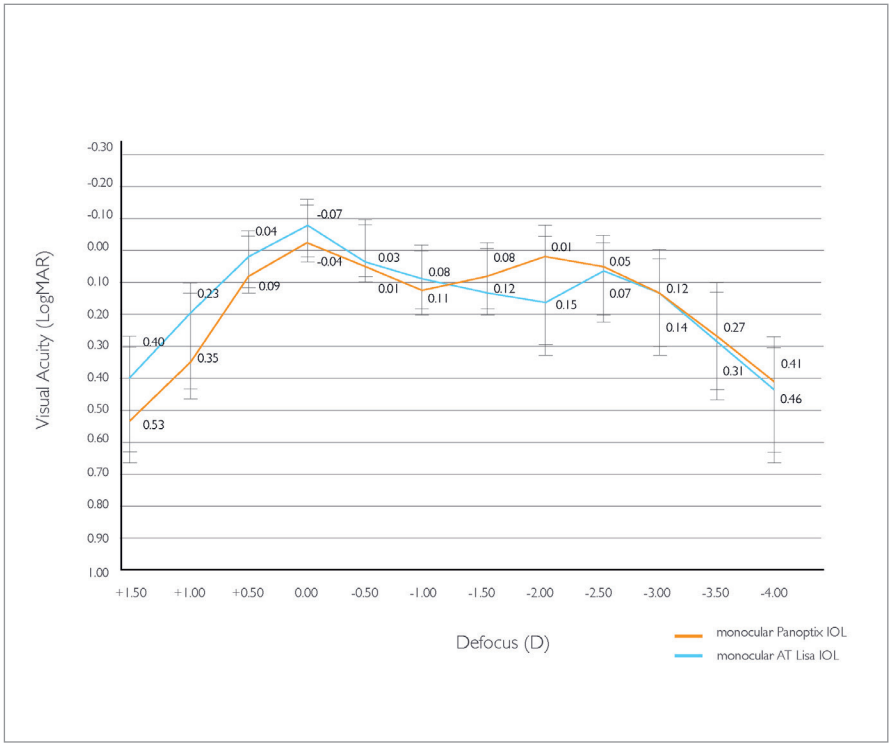


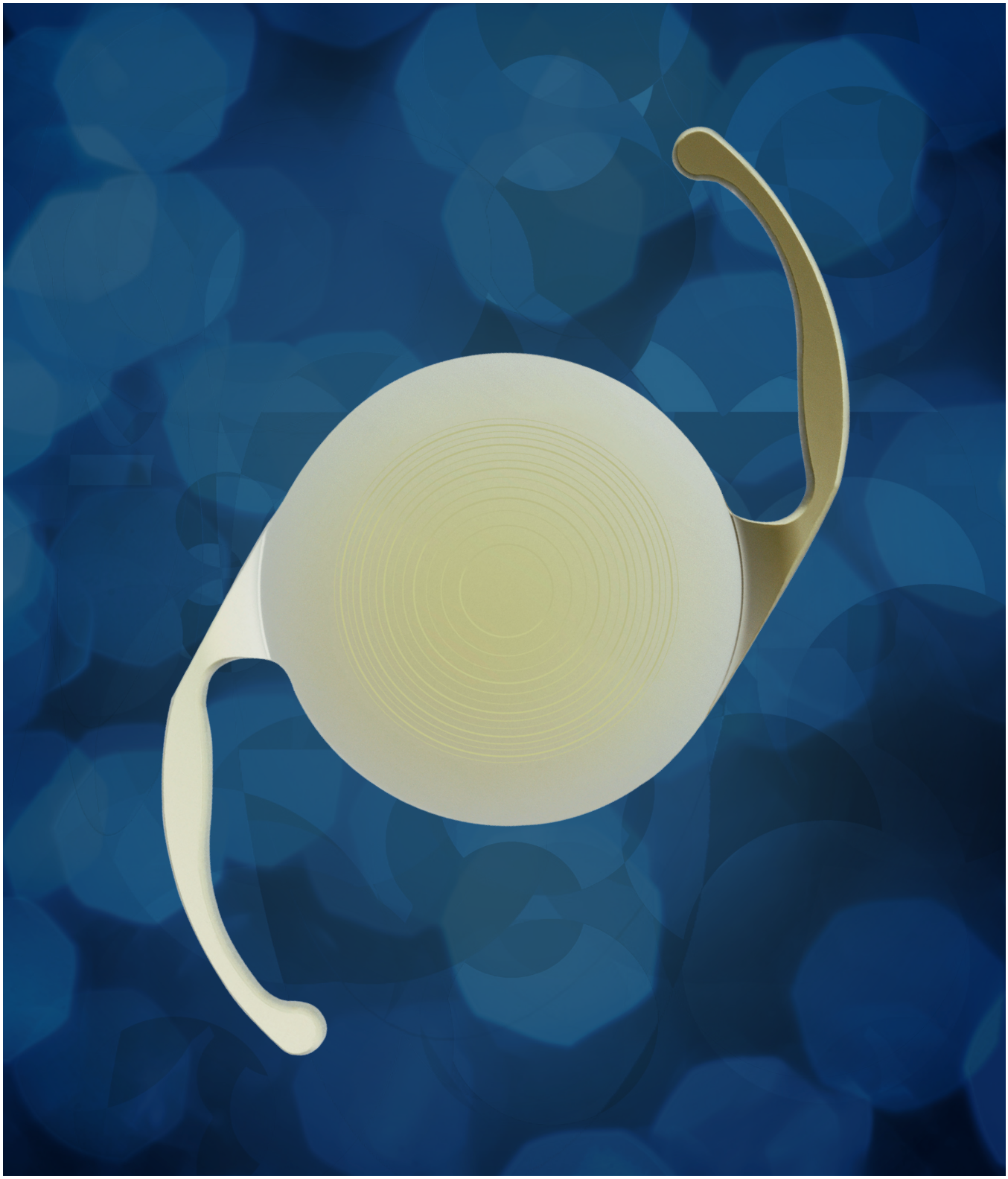
Figure 4. Monocular defocus curves for PanOptix™ and AT-LISA IOLs (12). Defocus curve testing was performed from -4.0 to +1.5 D in 0.5 D steps under photopic light conditions (ETDRS) in LogMAR.

PanOptix™ compared with AT-LISA

Dr. Myriam Böhm of University Hospital Frankfurt, Germany, presented results at the XXXV ESCRS annual meeting from their experience comparing visual performances of PanOptix™ and AT-LISA tri 839MP at 3 months (12). In their prospective comparative case series, visual outcomes, defocus curves and contrast sensitivities were assessed in patients who had received bilateral implantations of PanOptix™ (40 eyes in 20 patients) and AT-LISA (40 eyes in 20 patients).

There were no differences between both IOLs at far (4 m), intermediate (60 cm for PanOptix; 80 cm for AT-Lisa) and near (40 cm) distance for corrected and uncorrected monocular VA. Nevertheless, AT-LISA showed significantly better higher binocular UDVA

"The authors found that PanOptix™ provides more predictable refractive results compared to FineVision with better outcomes at distance and near positions."



(-0.09 ± 0.09 vs 0.00 ± 0.08;p=0.003), but no significant difference was found for the binocular DCVA.

The monocular defocus curves showed that both IOLs provided VA of 0.2 LogMAR or better between +0.0 D and -3.0 D, with PanOptix™ showing significantly better VA at a distance of 50 cm ($p<0.05$) (Figure 4). Assessments of contrast sensitivity showed no differences between the lenses, nor did subjective assessments of quality of vision.

"PanOptix™ provided significantly better VA at 40 cm and at the preferred reading distance than Symfony."

Spectacle independence was high across the board, with 100 percent of patients in the PanOptix™ group reporting spectacle independence at near and intermediate distances and 95 percent of patients reporting spectacle independence at far distance. Conversely, 100 percent of patients in the AT-LISA group reported spectacle independence at intermediate and far distance, but only 90 percent at near distance.

Both PanOptix™ and AT-LISA provided patients with excellent distance, intermediate and near visual performance, but PanOptix™ might be a preferable option for patients who have closer vision requirements at 60 cm.

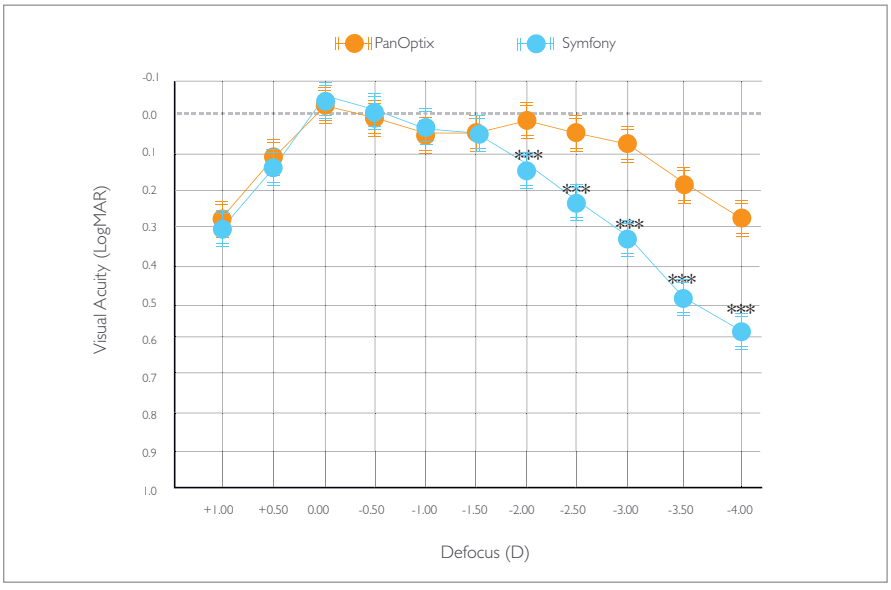


Figure 5. Binocular defocus curves for the PanOptix™ and Symfony IOLs (13). ***, $p<0.001$.

PanOptix™ compared with Symfony

In a dual-arm non-interventional study supported by Alcon, Ruiz-Mesa et al. (13; 2017) compared visual outcomes and optical performance of PanOptix™ (40 eyes of 20 patients) with Symfony (28 eyes of 14 patients). Monaco et al. (14; 2017) have also compared visual outcomes of PanOptix™ and Symfony at four months postoperatively, as well as compare those from the AcrySof® SN60WF monofocal lens (15). In this double-blind controlled clinical study, patients were randomized to receive PanOptix™, Symfony or AcrySof® IOLs (40 eyes of 20 patients for each). Visual outcomes from both studies comparing PanOptix™ and Symfony are presented in Table 4. Ruiz-Mesa et al. reported that a continuous range of vision (VA above 0.1 LogMAR) was seen from 0.00 to -3.00 D for PanOptix™ and 0.00 to -1.50 D for Symfony, demonstrating that vision was better between 50 and 25 cm with PanOptix™ (13; Figure 5). Monaco et al., reported that PanOptix™ performed better than Symfony at vergences of -1.5 D and -2.5 to -4.0 D in the binocular defocus curve, and that both IOLs performed better than the monofocal IOL for defocus vergences between -1.0 D to -4.0 D (14).

VA at intermediate and far distances was found to be excellent for both PanOptix™ and Symfony IOLs, with PanOptix™ showing a significantly better performance at near distances in both studies (13,14; Table 4). PanOptix™ was found to have significantly better DCNVA at 40 cm and VA at preferred reading distance than Symfony (13). Monaco et al. reported that patients who had received PanOptix™ showed better monocular DCNVA than those who received Symfony ($p=0.005$), with both groups showing better results than those who had received the AcrySof® monofocal IOL ($p<0.001$ for both PanOptix™ and Symfony versus AcrySof®).

No significant differences were found between PanOptix™ and Symfony binocular contrast sensitivity under

Table 4. Visual outcomes of PanOptix™, Symfony and AcrySof® monofocal IOLs

	Ruiz-Mesa et al. (13)		Monaco et al. (14)		
Mean ± SD, LogMAR	*PanOptix™*	*Symfony*	*PanOptix™*	*Symfony*	*AcrySof® monofocal*
UDVA	0.00 ± 0.03	0.05 ± 0.12	0.00 ± 0.04	0.03 ± 0.05	0.02 ± 0.06
CDVA	-0.03 ± 0.03	-0.02 ± 0.03	-0.01 ± 0.01	-0.01 ± 0.02	-0.01 ± 0.02
UIVA			0.23 ± 0.07 (p=0.04 vs. Symfony; p=0.001 vs. AcrySof monofocal)	0.27 ± 0.08 (p=0.001 vs. AcrySof monofocal)	0.42 ± 0.09
DCIVA (80 cm)	0.06 ± 0.06	0.06 ± 0.04			
DCIVA (67 cm)			0.13 ± 0.07 (p=0.001 vs. AcrySof monofocal)	0.16 ± 0.07 (p=0.001 vs. AcrySof monofocal)	0.29 ± 0.11
DCIVA (60 cm)	0.06 ± 0.10	0.05 ± 0.04			
UNVA			0.02 ± 0.06 (p=0.05 vs. Symfony; p=0.001 vs. AcrySof monofocal)	0.07 ± 0.08 (p=0.001 vs. AcrySof monofocal)	0.38 ± 0.10
DCNVA	0.04 ± 0.06 ***	0.20 ± 0.06	0.01 ± 0.04 (p=0.005 vs. Symfony; p=0.001 vs. AcrySof monofocal)	0.07 ± 0.07 (p=0.001 vs. Acrysof monofocal)	0.32 ± 0.09

****p<0.001*

Visual acuity are expressed as mean ± SD in LogMAR units. CDVA, corrected distance visual acuity; DCIVA, distance-corrected intermediate visual acuity; DCNVA, distance-corrected near visual acuity; UDVA, uncorrected distance visual acuity; UIVA, uncorrected intermediate visual acuity; UNVA, uncorrected near visual acuity. Adapted from (13,14).

"PanOptix™ and AcrySof® monofocal IOLs each showed significantly lower HOA values compared with Symfony at 5.0 mm pupil diameter (p<0.05)."

mesopic and photopic conditions. HOA values were also similar (13), and PanOptix™ and AcrySof® monofocal IOLs each showed significantly lower HOA values compared with Symfony at 5.0 mm pupil diameter ($p<0.05$) (14). Both PanOptix™ and Symfony were found to show similar levels of dysphotopic phenomena (13); Monaco et al. reported that the mean dysphotopsia score was significantly higher for both PanOptix™ and Symfony compared with the AcrySof® monofocal ($p\leq0.007$), with halos being the most frequently reported symptom (14). These studies showed that PanOptix™ and Symfony provided comparable visual outcomes at far and intermediate distances, with PanOptix™ providing significantly better VA at 40 cm and at the preferred reading distance, as well as showing a more continuous range of vision. Monaco et al. reported that PanOptix™ and Symfony provide comparable quality of distance vision to the AcrySof® monofocal IOL, but provide better quality of intermediate vision; they suggest that PanOptix™ "might be better for patients with near vision requirements" (14).

PanOptix™: clinical comparison

As part of the 'Bridging the Gap to Cataract Refractive Surgery' symposium held at the XXXV Congress of the ESCRS, Prof. Rudy Nuijts presented data from his institute – the Maastricht University Medical Centre (MUMC+) – comparing PanOptix™ outcomes (47 eyes, 3 months follow-up) with FineVision (30 eyes, 6 months follow-up), Symfony (22 eyes, 3 months follow-up) and

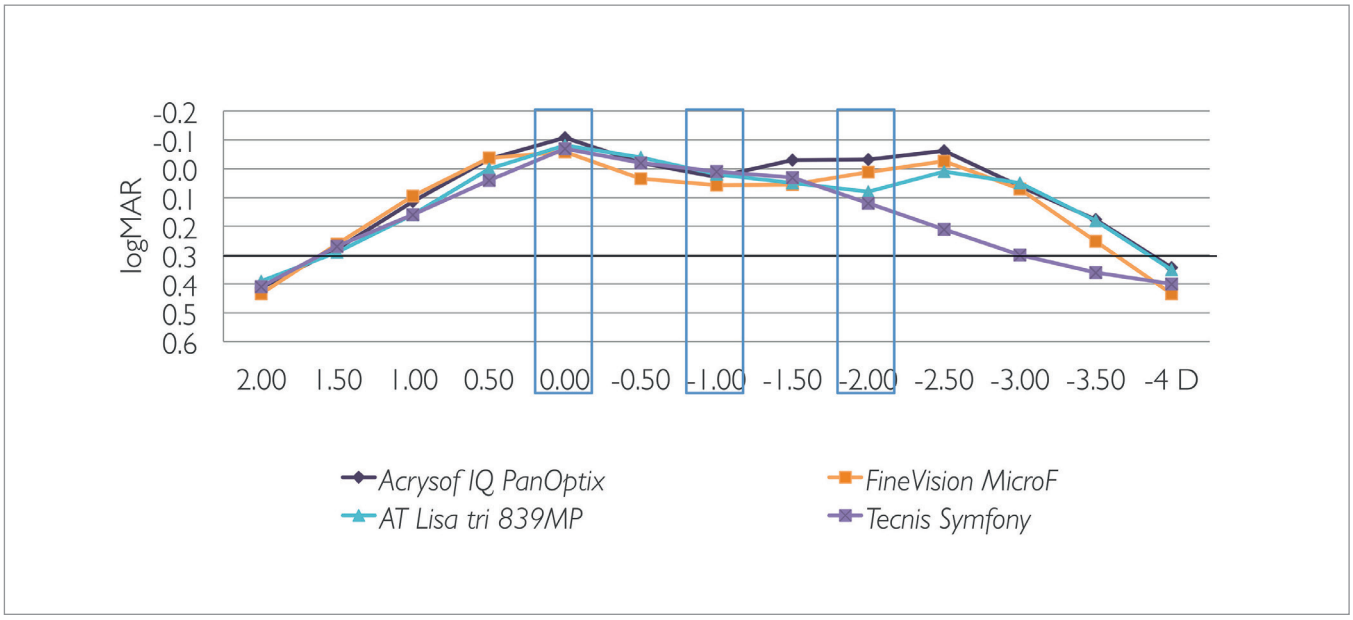


Figure 6. Defocus curve showing data obtained from studies conducted at the Maastricht University Medical Centre (MUMC+).

AT-LISA (22 eyes, 3 months follow-up) IOLs.

Defocus curves are presented in Figure 6. Prof. Nuijts reported excellent distance VA and near VA in PanOptix™ patients. The defocus curve showed that there was a continuous range of defocus in all IOLs and that intermediate distance was similar.

Prof. Nuijts also presented data comparing the contrast sensitivity and glare with the PanOptix™ and FineVision IOLs three months after implantation (Figure 7). Under both photopic and mesopic conditions, PanOptix™ demonstrated excellent contrast sensitivity. Less incidences of glare were also reported by patients who received PanOptix™; only 22 percent complained of glare compared with 47 percent of FineVision patients. Prof. Nuijts concluded his presentation by sharing his personal experience with PanOptix™, stating that it is currently the preferred multifocal IOL at MUMC+ because of the following features: good predictability of refractive outcomes, excellent VA at all distances, contrast sensitivity similar to age cohort, very few complaints of glare and halos, and highly satisfied patients.

Concluding remarks

To conclude, the clinical evidence obtained so far has demonstrated that PanOptix™ provides good visual outcomes for patients across all distances. One month after implantation, PanOptix™ showed good refractive and visual outcomes, and high rates of spectacle independence. Clinical evidence obtained beyond one month postoperatively showed that visual outcomes with PanOptix™ improved over time, as did the incidence of photic phenomena. Compared with the FineVision IOL, PanOptix™ performed better at intermediate and near distances, and showed more predictable results. PanOptix™ also performed better at a close intermediate distance (60 cm) compared with the AT-LISA IOL, which is not surprising considering that the PanOptix™ intermediate focal point is at 60 cm and the AT-LISA intermediate focal point is at 80 cm. Compared with the Symfony IOL, PanOptix™ showed a better near performance as well as a more continuous range of vision. As the number of surgeons using PanOptix™ and the number of patients receiving it increases – as well as duration of postoperative follow up – the clinical evidence for this innovative presbyopia-correcting IOL is only set to grow.

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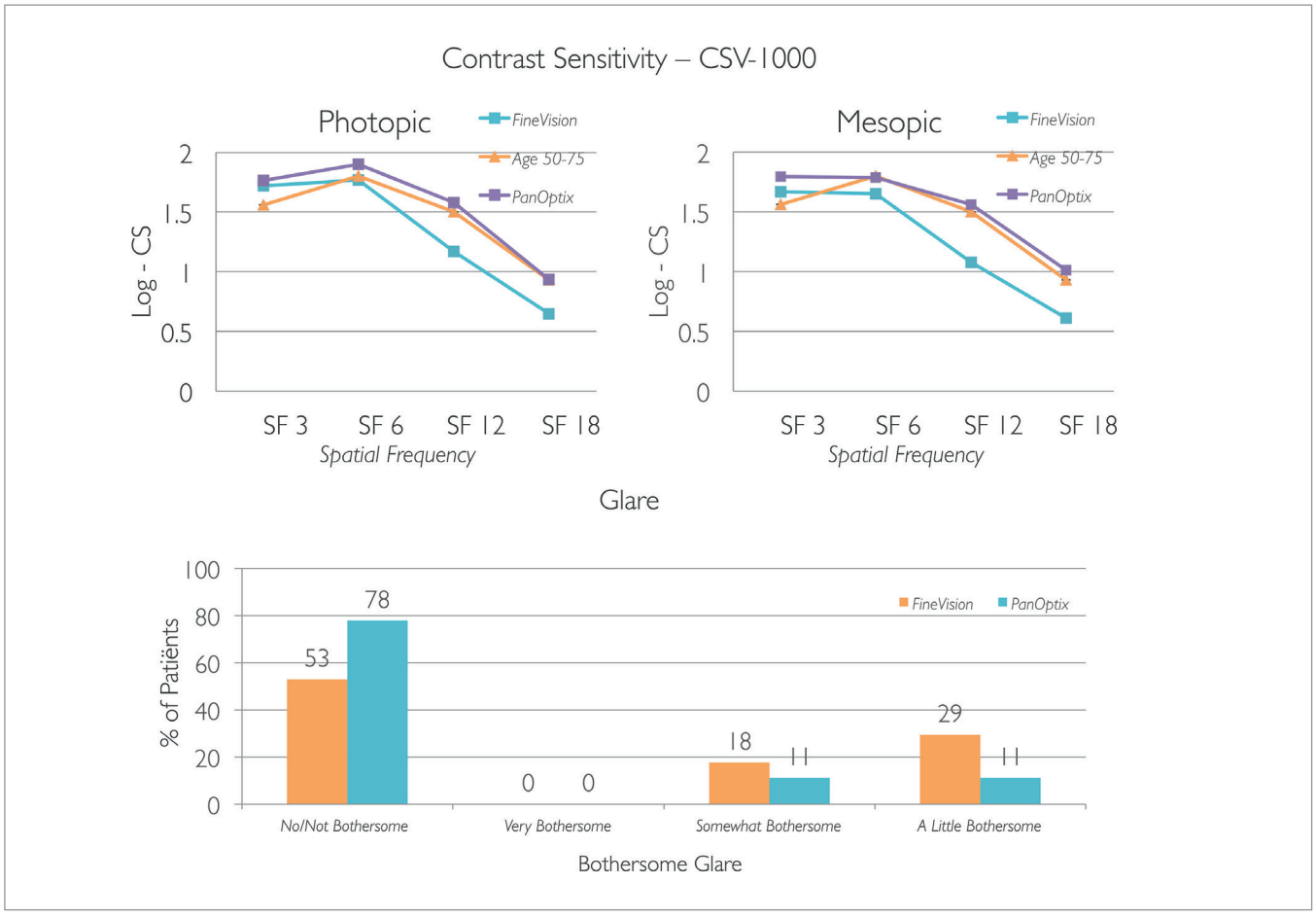

Figure 7. Contrast sensitivity (CSV-1000) with PanOptix™ and FineVision under photopic and mesopic conditions (a) and reports regarding glare complaints from patients who received PanOptix™ and FineVision IOLs (b).

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